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Regional Economic Disparities In Canada

by
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ABSTRACT

The purpose of this study is to provide a new look at the evolution of regional disparities in Canada in light of the recent convergence studies produced by European and American economists. The degree of convergence of a variety of per capita income measures and for output from the mid-1920s to today are analyzed. The empirical analysis suggests that there is evidence of convergence in Canada for different measurements of per capita income and output since the early 1960s. During this period, convergence has been helped by a favourable change in terms of trade and government transfers and taxes. However, there is no evidence of convergence prior to 1960. We, therefore, conclude that convergence in Canada is not necessarily the rule.

RÉSUMÉ

L'étude jette un nouvel éclairage sur l'évolution des disparités régionales au Canada à la lumière des études de convergence produites récemment par des économistes européens et américains. L'originalité de l'étude réside dans les comparaisons qui y sont faites entre le degré de convergence d'une variété de mesures du revenu et de la production par tête du milieu des années 20 à nos jours. Les résultats empiriques montrent que la convergence - la tendance à l'élimination des disparités régionales - est un phénomène relativement nouveau puisqu'il n'a été observé que depuis le début des années 60. Durant cette période, la convergence a été favorisée par l'évolution des prix relatifs régionaux (termes de l'échange), des paiements de transfert et du régime fiscal. Cependant, l'hypothèse de convergence peut être rejetée pour la période avant 1960. Force est donc de conclure que la convergence des économies régionales n'est pas nécessairement la règle au Canada.

In Canada, considerable attention has been devoted to regional economic disparities from economists (e.g., Innis 1930, 1940, McInnis, 1968, ECC 1977, Mensell and Copithorne 1986), social scientists in general, and politicians. In recent years, the subject of regional disparities has regained in popularity in the European and the American academic communities. A number of studies that specifically focused on the subject of convergence have been published: among others, Barro and Sala-i-Martin (1991, 1992a, 1992b) compare convergence in per capita income for the U.S. states with different groups of countries and regions; Rodwin and Sazanami (1988, 1991) examine the regional economic characteristics and trends in the U.S., France, Germany, Italy, Sweden, and the U.K.; and Blanchard and Katz (1992) analyze employment growth across U.S. states.

This "new" interest by American and European economists in the subject of regional disparities can be explained by two phenomena. First, progress in theoretical modelling has made it much easier to introduce externalities, imperfect competition, and scale economies in growth models. As a result, the study of the new endogenous growth models, that can explain convergence as well as divergence among different groups of nations and within different regions of a country, is now popular in mainstream economics. Second, many growth and development-related issues have emerged recently at the forefront of economic and political problems. For example, the worldwide slowdown in productivity growth has been identified as one of the most significant economic problems since the mid-1970s. Furthermore, many of these growth and development issues have direct implications for regional studies. Even if European economic integration is expected to make the whole region more prosperous, there is an increasing concern that an integrated Europe may exacerbate the problems of regional imbalance and inequality. Particularly, increased integration may accelerate the decline in regional industrial centres.[1] Apprehensions have been raised regarding the effect of the economic and social reforms in the former USSR and Eastern Block Countries on regional disparities within those countries and on regional growth in the European Community. Concerns of these types also apply to Canada and the U.S. which have experienced de-industrialization in a few manufacturing centres, yet face a more integrated North American market. The implications of globalization on regional development is unclear.

Regionally-balanced economic development is particularly important for a diverse and geographically large federal state such as Canada. Regional disparities put significant pressures on fiscal federalism for the financing of local public goods. In this context, economic disparities translate into a differential tax burden per unit of public good across local governments. The traditional solution adopted in Canada to this problem has focused on

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1. These areas are not only peripheral rural or resource based regions, but also formerly prosperous industrial areas that have difficulty attracting new investment.

geographical redistribution of resources operated through the equalization system. For example, the Constitution Act of 1982, section 36 spells out federal responsibilities in the areas of regional disparities and equalization:

> *(1) ...the Government of Canada and the provincial governments are committed to: (a) promoting equal opportunities for the well-being of Canadians,(b) furthering economic development to reduce disparity in opportunity, and (c) providing essential public services of reasonable quality to all Canadians*
>
> *(2) Parliament and the Government of Canada are committed to the principle of making equalization payments to ensure that provincial governments have sufficient revenues to provide reasonably comparable levels of public services at reasonably comparable levels of taxation.*

The purpose of this study is to provide a new look at the evolution of regional disparities in Canada in light of the recent convergence studies produced by European and American economists. We will concentrate on the convergence of per capita income and output patterns from the beginning of the 1900s to today.[2] The paper is mainly diagnostic in nature and the more difficult task of finding solutions from the policy point of view is left untouched.

The paper is organized as follows. The first section discusses different approaches to regional economic disparities. The methodology is explained in Section 2 and the empirical results are presented in Sections 3. The last section concludes.

1. Three approaches to Regional Disparities

The problem of regional economic disparities is complex in nature and is closely related to economic growth and development theories. In Canada, and in other countries, numerous economists and social scientists for many years have studied the problem and a number of theories -- some competing, others complementary -- have been advanced to explain the causes and consequences of uneven economic development. Three important approaches are reviewed briefly in this section.

1.1. The Staples Approach

This approach is a significant Canadian contribution to regional economic theory (Innis 1930, 1940, MacIntosh 1936 and, Watkins 1963). According to this theory, the economic prosperity of a region depends on the availability and marketability of natural resources. The discovery of marketable resources leads to an inflow of capital and firms bringing in higher incomes and a growing demand for labour. However, once the resources

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2. Along this line, recently, Helliwell and Chung (1991) combine the ten provinces in Canada with other OECD countries to analyze convergence. Our analysis will be slightly different.

are depleted or not marketable, capital leaves the area. According to the theory, the relative prices of natural resources and manufactured goods should be a central determinant of the evolution of regional disparities. The staple theory bears a number of common features with the growth pole and core/periphery models discussed below regarding the allocation of economic activities.

This theory is capable of explaining some aspects of regional economic disparities in Canada. The early growth in Atlantic Canada was attributed to its fish and timber resources. Alberta's economic prosperity in the 1970s was due to its gas and oil resources. But the theory does not explain why Southern Ontario and South-western Quebec have succeeded in industrializing their economies compared to other regions of Canada. A study by the Economic Council of Canada (1977) argues that natural resources are only one of many factors determining the prosperity of a region. And their importance is minor in comparison to other factors such as physical and human capital, the level of technology, scale economies, etc. Yet, the importance of natural resources cannot be ignored due to their highly immobile nature which makes them different from other factors.

1.2. Market Adjustment, Neo-classical Paradigm and Endogenous Growth

The market adjustment neoclassical approach to regional disparities emphasizes the importance of flexibility in prices and wages, the mobility and substitutability of capital and labour, and relies on market forces to set the necessary equilibrium. For example, high unemployment in a region leads to lower wages. This will induce labour to flow out of the region and capital to flow in, since workers are attracted to regions with higher wages and firms are drawn into the region to take advantage of lower wage costs. This process will simultaneously raise income in the poor region and lower it in the rich region; in the long run, the income between the two regions will be equalized. In this context, regional economic disparities result from the failure of the market brought on by circumstances or government interferences.

Courchene (1981, 1986) has always been a key proponent of this approach in Canada. He argues that this adjustment process has not worked due to wage rigidity at the provincial level. He puts forward three reasons for the existence of wage rigidities: first, the tendency for the federal government, large corporations and unions to impose wage parity across the country with little consideration to the local labour market conditions; second, the tendency for the poor provinces to have higher minimum wages than the richer provinces; third, transfer payments from Ottawa[3] including generous unemployment insurance (UI) benefits.[4]

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3. Courchene argues that transfer payments encourage local governments to be irresponsible and dependent. For example, a province imposing a high minimum wage does not bear the full financial and economic costs of the policy due to UI transfers and equalization payments from Ottawa.

The combination of these three factors means that poor regions would remain poor since there is no market adjustment mechanism to reach the necessary equilibrium to alleviate the disparity.

An important qualifier has to be made at this point regarding the convergence mechanism in the neoclassical framework. It has long been recognized in economic theory (Myrdal (1957)) and in regional studies in Canada (Williamson (1965) and Matthews (1981)) that the migration process can widen regional economic disparities. The reason for this is that interregional labour migration can be extremely selective in terms of age and human capital. It is then possible for poor regions to lose their best people through out-migration while rich regions are stimulated by the new migrants.[5] External economies and general benefits derived from agglomeration of capital projects in the relatively rich region may also cause capital to emigrate from the poor to the rich region.[6] Divergent mechanisms of these types are at the core of modern endogenous-growth/trade models. Lucas (1988) presents two models in which increased trade and economic integration can, in some circumstances, widen economic disparities between states and regions. In one model, two goods are produced and traded between regions. The production of both generates learning-by-doing. But one good has a much greater potential of generating learning-by-doing than the other. Consequently, specialization in comparative advantage and international or interregional trade can worsen the situation in some region. In another model, the production of goods at the firm level generates Marshallien externalities under the form of knowledge that can be used by all other firms in the same region/country. Comparable factors of production will then be more productive in the rich country/region than in the poor. This is precisely what has been found by Mansell and Copithorne (1986, p. 32), among others, for Canada: *"it is not the regional differences in industrial structures per se which account for most of the earning disparities;*

4.(...continued)

4. Revisions to the unemployment insurance program introduced in 1972 substantially increased benefits which were extended to include coverage of maternity and sickness. It also reduced the number of weeks needed for qualification and allowed claimants in high-unemployment regions to receive benefits for a longer period of time (up to 18 weeks longer).

5. Williamson argues that migration is likely to be less selective as economic development proceeds. The selective migration will reduce the wage differentials between the skilled and unskilled labour in the rich region which will eventually cause a change in the composition of migration. The poor regions, therefore, may not only retain their educated and skilled labour while losing its unskilled labour, but may even attract the former type of migrants from the rich.

6. Of course, external economies and benefits accruing from agglomeration may become exhausted at the margin in the rich regions while they begin to assert themselves in the poorer regions as industrialization proceeds. Therefore, if growth becomes relatively rapid in the poor region due to any other factors, the capital flow will most likely undergo a natural reversal causing a convergence in per capita income.

rather, it is that an individual working in a given industry in, say the Atlantic region earns considerably less than one working in the same industry in other regions".

1.3. Development Poles and Core/Periphery Model

One of the original approaches to regional economic development called the "growth pole" was developed by Perroux (1955). He argued that economic growth does not appear everywhere at the same time since economic activity tends to concentrate around certain growth poles. These growth poles could consist of a set of firms or industries that propel economic growth in the region. At the same time, the growth pole concept was elaborated in terms of urban centres by Myrdal (1957).

According to this approach, regional economic disparities result from variations in productivity due to an absence or deficiency in some factors. Governments can provide incentives in the form of grants and subsidies to encourage business to strengthen and to start these focal points in slow-growth regions. In this sense, governments can employ region-specific policies to meet each region's needs. These include: providing an adequate public infrastructure; increasing the quality of the labour force; promoting the adoption of new technology; and modernizing the agricultural sector.

The popularity of structural/growth pole approaches has increased in mainstream economic circles in recent years following the development of the "new" trade and growth theories. As mentioned earlier, these theories point out the importance of increasing returns, imperfect competition, and multiple equilibria in analyzing economic phenomena. These interesting characteristics can be easily incorporated into a model where the concept of a growth pole is expanded to the concept of the growth centre to provide more spatial framework as in Krugman (1991). He identifies four factors causing an industrial centre: namely, increasing returns at the level of individual firms; low transportation costs; sufficiently high local demand;[7] and external economies resulting from the interactions of these firms.[8] These four factors tend to reinforce the initial location decisions of firms to form a concentration of manufacturing production.

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7. The geographical structure of production is likely to be stable until there is a major shift in population. For instance, when a growing region reaches a critical mass of population, firms may relocate to this region to form a new centre. This change may be rapid since one firm's decision reinforces others through external economies.

8. There are three reasons for these external economies. First, a firm in an industrial centre has direct access to a pooled market for skilled workers. Second, an industrial centre allows more specialized local suppliers at lower cost. Third, an industrial centre generates technological spillovers.

This centre-periphery approach can be used to explain Canada's manufacturing centre in Southwestern Ontario. Immediately after confederation, a tariff wall and subsidized transportation costs enlarged the Canadian market. A relatively large population in Ontario and strong economies of scale made it rational for manufacturers to serve the national market from Ontario in order to minimize transportation costs. At the same time, geographical proximity to the U.S. manufacturing centre meant that the Canadian manufacturers were able to reap technological spillovers from their counterparts in the U.S. This initial core induced other manufacturers to locate in Ontario to gain direct access to skilled labour and cheaper intermediate inputs and to benefit from technological spillovers. The automotive assembly and the supporting automotive parts industries located in Southwestern Ontario are typical examples of this. Other good examples of the centre-periphery approach are the waste-water treatment industry at the Southwest corner of Lake Ontario, the telecommunication industry in Ottawa, and the aerospace industry around Montreal. In contrast, the Canadian human biological products industry has remained geographically dispersed due to competing federal and provincial government policies in attracting the industry. This is different from countries such as Switzerland or the U.S., where knowledge-intensive, pharmaceutical-related research tends to be concentrated in Basel and Philadelphia/New Jersey respectively. Porter (1991) argues that this dispersion of bio-pharmaceutical firms has likely worked against the development of strong related and supporting industries in Canada.

2. Methodology

In most studies, the convergence question is set in the neo-classical framework in which convergence is assumed. The purpose then is to test whether this convergence occurs or not and, if yes, at what speed. The purpose is not to explain convergence. We follow this approach. Since our framework is basically same as the one used by Barro and Sala-i-Martin (1991, 1992a, 1992b), we will simply highlight what is distinct in our analysis.

Two different concepts are used in the literature to estimate convergence between regional and national units. The first one, called β-convergence, refers to the speed of convergence of the poor region to the level of the rich one. It is usually measured by "half-life" of convergence, i.e., the number of years it would take for half of the gap between the rich region and the poor region to be eliminated. The second measure is based on the evolution of σ-convergence, a measure of the cross-sectional dispersion of the economic indicator (per capita income or output).

2.1 Estimation of β-convergence

In a neo-classical framework, convergence between economies is modelled as a transitional dynamics toward steady state. If two economies have relatively similar technological, preference, and demographic endowments, the key prediction of this framework is then that the economy with the lower initial level of income per capita will grow faster. In this case, the β coefficient is usually referred to as measuring unconditional convergence, i.e., the speed of convergence is not conditional on observed differences in other parameters. As

in Barro and Sala-i-Martin (1991, 1992a, 1992b), this coefficient is usually estimated using cross-sectional data in the following non-linear form:

$$\frac{1}{T-t} \cdot \ln\left(\frac{Y_{iT}}{Y_{it}}\right) = B - \left(\frac{1 - e^{-\beta(T-t)}}{T-t}\right) \cdot \ln Y_{it} + u_i \qquad (1)$$

where i refer to the regional unit, Y is output (or income) per capita, B a constant term across economic units, u an error term, and t and T are initial and final year respectively. The left-hand side is the average annual growth between time t and time T. The higher β, the faster the poor regional units converge to the level of the rich one.

As mentioned above, the convergence hypothesis is usually estimated using cross-sectional data (48 states and 97 countries in Barro and Sala-i-Martin (1991, 1992a, 1992b)). Simple cross-section tests will not be very reliable with only the ten provinces in Canada. One option is to mix the provinces with another sample such as OECD countries (Helliwell and Chung (1991)). The problem there is that the estimated coefficient for Canada can be largely determined by convergence forces that originate from other countries. It can also be argued that this approach implicitly assumes that convergence forces are the same at both cross-regional and cross-country levels by mixing cross-regional data with cross-country data.

We decided to use another method by creating a sample of 10 cross-sections and 3 time series (pooled cross-section time series) by dividing observations in three sub-periods where each provincial series from 1961 to 1991 are divided to form three annual decennial compound growth rates: 1961-71, 1971-81, 1981-91. But this approach will yield biased estimates due to an observed time trend: the average growth rate of the ten provinces has significantly decreased from the 60s to the 70s and from the 70s to the 80s. But the purpose of this paper is to find out whether the gap between the rich region and the poor region has been closing and not whether the regions have been growing at a slower rate in the 80s compared to earlier periods. Therefore, both of the cross-section and the time trend effects are likely to be picked up in a simple pooled regression. Thus, in order to eliminate this time trend effect, we chose to regress the growth rate relative to the Canadian average during the time period on the initial level of income relative to the Canadian average for the same time period, for each of the three sub-periods as shown in equation (2):

$$\frac{1}{10} \cdot \ln\left(\frac{Y_{i,t+10}/\bar{Y}_{t+10}}{Y_{it}/\bar{Y}_t}\right) = B - \left(\frac{1 - e^{-\beta 10}}{10}\right) \cdot \ln\left(\frac{Y_{it}}{\bar{Y}_t}\right) + u_{it} \qquad (2)$$

$$\textit{where } i = 1, \ldots, 10;\ t = 1961, 1971, 1981$$

where $\bar{Y}$ refers to the weighted (by population) Canadian average.

2.2 Dispersion Indexes

The catch-up process (β-convergence) works to reduce the cross-sectional dispersion of per capita income or output, holding exogenous disturbances in the economy constant. The concept of σ-convergence refers to a decrease through time in the cross-regional dispersion of per capita income/output.

This σ-convergence can be measured in several different ways. We can take the standard deviation of log per capita income as Barro and Sala-i-Martin (1991, 1992a, 1992b) have done or simply use the coefficient of variation. A third option is to weight each province by its population. We use this third option and construct a weighted coefficient of variation[9] since we are ultimately interested in the evaluation of the amount of resources (through equalization for example) needed to reduce regional disparity. The indicator is expressed as the following:

$$V_{wt} = \frac{\sqrt{\left(\sum_{i=1}^{10} \frac{POP_i}{\Sigma POP_i}(Y_{it} - \bar{Y}_t)^2\right)}}{\bar{Y}_t} \qquad (3)$$

where, POP_i = the population of province i, and $\bar{y}_t$ is the average of Canadian per capita income (or output). The deviation of each province is then weighted by population.

2.3. Data

Six different concepts of per capita income or output displayed in Table 2.1 are used in the statistical part of this study. The ten provinces are used as the regional units for the 1961-1991 period while the analysis of the post-1926 period is based on the economic growth of five regions. All economic indicators that measure income and output are on a per capita basis. The four measures of income: earn income (EI), personal income (PI), personal income minus government transfers (PIT), and personal disposable income (PDI) are deflated by a provincial CPI that is comparable across provinces.[10] Two concepts of real gross provincial product (GPP) are used for the estimation of β convergence. The first one is the GPP deflated by a national price index (GPPNAT) and the second one is the GPP deflated by the Conference Boards' estimates of provincial implicit price indices (GPPPRO). The two

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9. Using other indicators do not change qualitative results.

10. Provincial CPIs reflect only provincial differences in inflation rates, but not price levels (i.e. provincial CPIs are all set to 100 in the same base year). Therefore, in order to capture provincial differences in price levels, these have been adjusted using the 1986 spatial index reported in Létourneau (1992) which includes the cost of shelter.

concepts give significant different estimates of convergence and we will come back in section 3 to the conceptual differences between the two measures.

TABLE 2.1 National Account Concepts

Mnemonics	Descriptions
GPPPRO	Gross provincial product at factor cost per capia, provincial indexes
GPPNAT	Gross provincial product at factor cost per capita, national index
EI	Earned income per capita
PIT	Personal income minus government transfers per capita
PI	Personal income per capita
PDI	Personal disposable income per capita

Note: A detailed description is given in the Appendix.

Provincial price deflators and GPP at factor cost are only available from 1961. Therefore, regression analysis for the estimation of β convergence in Canada covers only the period since 1961. We also go as far back as 1926 for four series (PI, PDI, EI, PIT) with the analysis of σ-convergence to bring out historical trend. But prior to 1961, all four series are deflated by a national CPI.

3. Empirical Results

3.1. β-convergence in Canada since 1961

As illustrated by Figures 3.1 and 3.2, convergence patterns differ significatively according to the national accounts measure chosen. When the GPP per capita deflated by regional price deflator is used, a weak inverse relationship between the average over the 1961-1991 period and the initial level of GPP emerges from Figure 3.1. This weak inverse relationship indicates a weak β-convergence. A stronger inverse relationship emerges for the PDI case (Figure 3.2). This illustrates the fact that the choice of the national accounts measure matters and that some information can be inferred from the comparison of estimates from different national income concepts.

Figure 3.1
Convergence of Gross Provincial Product
(Regional Deflators) across Canada: 1961-1991

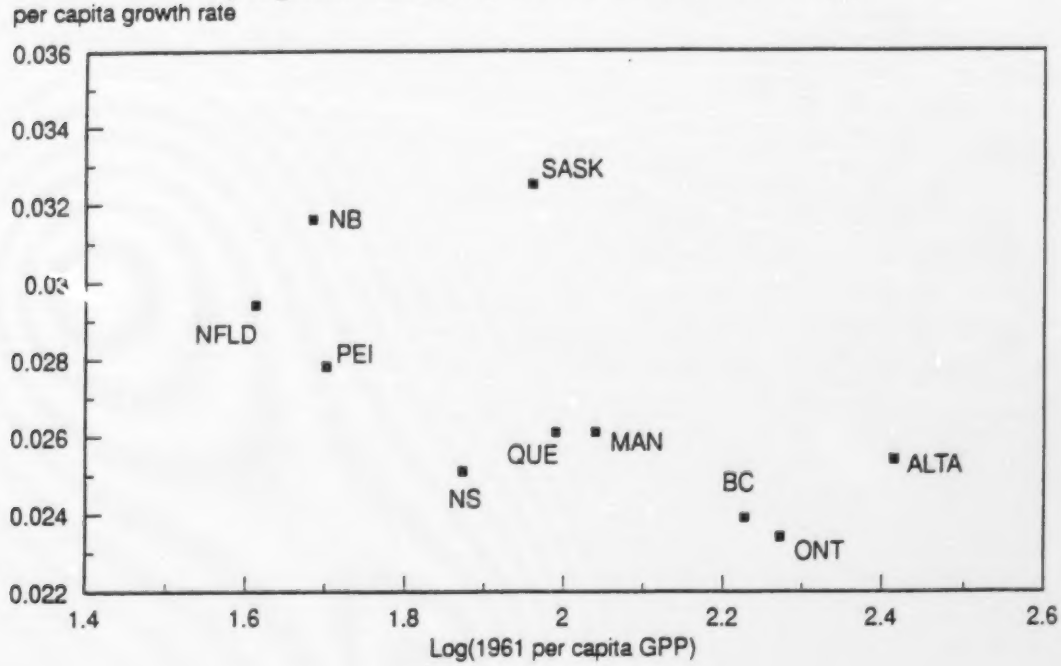

Figure 3.2
Convergence of Personal Disposable
Income across Canada: 1961-1991

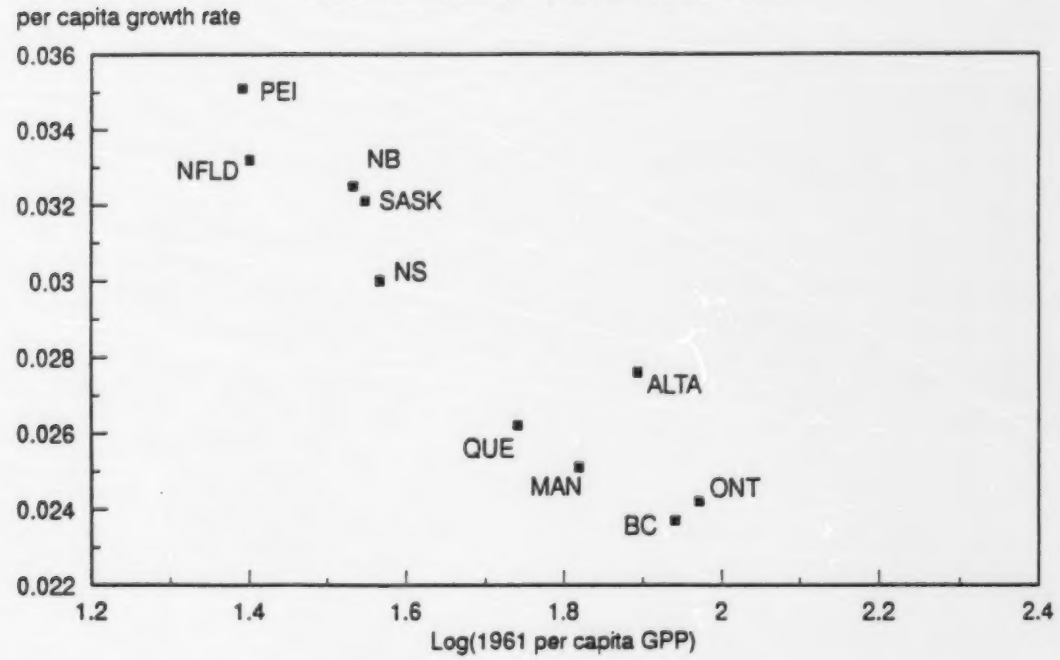

Table 3.1 contains the estimated convergence coefficient β (from equation 6) and its corresponding half-life for each data base. The estimated β coefficient for GPPPRO has a marginal t-ratio and convergence cannot be rejected at the 10 % level. Convergence cannot be rejected at the 5 % level, however, for the other five measures of per capita income.

TABLE 3.1 Convergence in Canada: 1961-1991

Variables	β	R^2	Half-life (years)
GPPPRO	0.0105	0.11	66
	(1.789)		
GPPNAT	0.0184	0.20	38
	(2.459)		
EI/POP	0.0162	0.21	43
	(2.634)		
PIT/POP	0.0163	0.18	43
	(2.393)		
PI/POP	0.0241	0.29	29
	(3.105)		
PDI/POP	0.0289	0.32	24
	(3.266)		

Note: Numbers in parentheses are t statistics. Adding the two territories lowers the convergence rates but does not change the basic findings. All series are adjusted using Finance's cost of living index except GPP/POP. The cost of living index, however, does not have a significant effect on the estimated coefficients.

The key differences between the income measures used in Table 3.1 are summarized in Table 3.2. This accounting framework is used to analyze the differences in the convergence estimate of income measures. Before focusing on the key results of Table 3.1, two preliminary remarks have to be done. First, the convergence rate for per capita EI suggests that the per capita income gap between the poor and the rich regions could be reduced by half in 43 years. This convergence speed virtually remains unchanged when net interest earnings and dividends are added to EI. In other words, the empirical estimate of β for per capita PIT is nearly equal to that of per capita EI. This suggests that dividends and net interest earnings do not affect the convergence rate significantly. The second points deals with the difference between income versus product convergence. The most significant difference between GPP and personal income is that GPP attributes capital income to the province in which the business activity occurs whereas they are attributed to the province of the asset holder with personal income measures. As pointed out in Barro and Sala-i-Martin (1992a), the high level

of factor mobility across provinces and states of the same country implies, in a neo-classical framework, much faster convergence at the regional level for output (GDP) than for income (GNP, PI) concepts. The results of Table 3.1 (for both GPPPRO and GPPNAT), consistent with Barro and Sala-i-Martin's own, contradict this theoretical reasoning.

TABLE 3.2 Definitions of Variables

Variables	Definition
EI	≡ GPP - Corporate Profits (Retained Earnings + Dividends) - Capital Consumption Allowance - Net Interest Earnings
PIT	≡ EI + Net Interest Earnings + Dividends ≡ GPP - Retained Earnings - Capital Consumption Allowance
PI	≡ PIT + Transfers from Government
PDI	≡ PI - Personal Direct Taxes

Note: Detailed description is given in Appendix A.

Two key results emerge from the estimates presented in Table 3.1: first, the last two incomes measures appear to converge much faster than the first two; second, there is a striking difference between the convergence rate estimate of per capita GPP when a provincial deflator is used instead of a national deflator. These two points are analyzed individually and then these results are compared with those found for other countries.

3.1.a Convergence of Income Measures

The first key empirical result is related to the difference between the convergence speed of EI and PIT on the one hand and PI and PDI on the other. When transfers to persons are added to PIT to form PI, the speed of convergence increases significantly; consequently, half-life decreases from 43 years to 29 years. The transfers therefore appear to reduce regional disparity substantially. Removing direct taxes from PI further increases the convergence rate and decreases half-life from 29 years to 24 years. Thus, direct taxes also appear have an effect of reducing regional disparities due to their progressive nature.

In a nutshell, both transfers and direct taxes appear to reduce regional income disparities *ex post*. And interest earnings and dividends do not appear to affect the convergence process.

3.1.b Regional Versus National Output Deflator

The second striking observation that emerges from Table 3.1 is that GPPNAT appears to converge much more rapidly that GPPPRO, the half-life of convergence of the former is 38 years while the one of the latter is 68 years.

Any estimate of β based on a national price deflator is determined by the evolution of nominal growth rates since a common deflator is applied across provinces. Estimates of this type, referred to as nominal convergence rates since they do not capture changes in regional relative prices, are common in regional studies performed in Europe and in the United States because of the lack of reliable regional price indexes in those countries. In Canada, however, the existence of regional indexes allows us to capture the effect of the evolution of regional cost of living and terms of trade on convergence patterns.

We did estimate nominal convergence for the four income measures of Table 3.1 using the national CPI. They were so close to the estimates of real convergence, based on regional cost of living indexes, that we do not present them in this paper.[11] The situation is different however for GPP. The significant differences in the speed of convergence for nominal and real per capita GPP indicate a greater variability in the rates of increase in output prices than those of consumer prices across the regions in Canada.[12] Convergence in nominal output is driven by two components: convergence in output prices and convergence in real output. Since the nominal GPP convergence rate is significantly higher than the real GPP convergence rate which is still different from zero, this implies that both relative output prices and productivity (assuming convergence in real output is driven by convergence in productivity) are converging.

The greater variability in output prices than consumer prices across the regions in Canada reflects the fact that the economic activities of firms are located unevenly across Canada while consumption patterns are relatively similar. Interpreted in a Staple theory framework, the comparative result on nominal versus real GPP convergence indicates that the

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11 They are, however, available from the authors on request.

12. This also reflects a difference between a closed economy and an open economy. The CPI is based on the prices of goods and services consumed including imports while the GPP deflator is based on prices of output produced in an economy. Thus, in a closed economy, output and income measures coincide. On the other hand, in an open economy where each region obtains income through trade of goods and services and transfers, output and income measures may not coincide because regions can incur balance of payments surpluses or deficits.

evolution in the prices of natural resources and in the relative price between natural resources and manufactured goods have been, since 1961, an important determinant of economic convergence in Canada. Furthermore, the relatively slow convergence in real per capita GPP suggests that the relocation of firms from the industrial core to the periphery regions is slow (the diversification process). Firms are reluctant to move away from the core and forego economies of agglomeration. That is, it simply takes a long time for external benefits from this agglomeration to be exhausted.

3.1c Cross-country versus Cross-region β-convergence

We compare now β convergence estimates for Canada with those of other cross-country and cross-region studies. Before going any further, a distinction has to be made regarding unconditional versus conditional convergence. Unconditional convergence refers to the case where convergence is explained solely by the gap between the initial economic indicator. This analysis supposes relatively similar structural parameters for preferences and technology across regions. This is the assumption implicitly made in our study. On the other hand, when structural parameters for preferences and technology are significantly different among these countries (or regions) due to variations in natural resources, saving rates, institutions, human and physical capital, initial per capita income/output differences can not be sufficient to explain differences in growth rates of these countries (or regions). Additional variables are needed to reflect these differences since countries (or regions) can have different equilibrium levels of income/output per capita in this case. This method of finding convergence while accounting for these differences is called conditional convergence.

Table 3.3 presents the estimated results from Barro and Sala-i-Martin (1991, 1992a). The additional variables in regression 2 include sectorial shift parameters to hold constant the effect of supply shocks. Changes in relative regional prices should be captured in these variables. No regional price deflator are available for the U.S..

Both of their estimates for conditional and unconditional convergence in the U.S. for per capita GSP (Gross State Product) are very similar, just over 2 % per annum, and are close to our estimates for the nominal convergence rates of GPP in Canada.

Barro and Sala-i-Martin (1992a) also estimate within-country β-convergence for seven countries using the country dummies. These results are also presented in Table 3.3. The U.K. and the Netherlands have higher than average and Italy, France, and Denmark have lower than average β convergence. The cross-country β average of 0.023 is close to the estimates we get for nominal convergence of output in Canada.

TABLE 3.3 Comparison of Within-country β Convergence for Per capita Output[1]

Sample	Additional Variables	β	R^2
1. U.S.: 48 States	No	0.0180	0.48
1963-1986		(3.051)	
2. U.S.: 48 States	Yes	0.0222	0.54
1963-1986		(3.415)	
3. Netherlands: 4 regions	No	0.0496	
1950-1985		(2.455)	
4. U.K.: 11 regions	No	0.0337	
1950-1985		(3.624)	
5. Belgium: 3 regions	No	0.0237	
1950-1985		(1.445)	
6. Germany: 11 regions	No	0.0230	
1950-1985		(3.770)	
7. Italy: 20 regions	No	0.0118	
1950-1985		(0.0036)	
8. France: 21 regions	No	0.0097	
1950-1985		(1.644)	
9. Denmark: 3 regions	No	0.0018	
1950-1985		(0.085)	

Note: Numbers in parentheses are t statistics.

(1) Barro and Sali-i-Martin (1991, 1992a).

The additional variables included in regression 2 are regional dummies, the sectoral composition variable, and the fraction of workers in 1960 with college education. The β coefficients for the last seven countries are jointly estimated using county-dummy variables and the agriculture and industrial share variables that vary over the subperiods but not across the countries.

Table 3.4 shows the estimates of β for the U.S. and Japan's per capita personal income. All their estimates are close to 2 % per annum. Their estimates for the U.S. are slightly lower than 2 % per annum while their estimates for Japan are slightly higher than 2 % per annum. Furthermore, there is no significant difference between their unconditional and conditional convergence rates. Their estimate of U.S.'s unconditional per capita PIT convergence rate (0.017) is close to our estimate for Canada's real per capita PIT (0.0163). On the other hand, their estimate of Japan's unconditional per capita income convergence rate

is slightly higher than that of Canada's real per capita PIT but much closer to that of Canada's real per capita PI (0.0241).

TABLE 3.4 Comparison of Within-country β-convergence for Per capita Personal Income:[1]

Sample	Additional Variables	β	R^2
1. U.S.: 47 States 1880-1988	No	0.017 (6.107)	0.87
2. U.S.: 47 States 1880-1988	Yes	0.018 (3.804)	0.92
3. Japan: 47 Prefectures 1930-1987	No	0.028 (9.000)	0.92
4. Japan: 47 Prefectures 1930-1987	Yes	0.028 (11.667)	0.96
5. Japan: 47 Prefectures 1955-1987	No	0.0201 (5.583)	0.57
6. Japan: 47 Prefectures 1955-1987	Yes	0.0230 (6.053)	0.76

Note: Numbers in parenthesis are t statistics.
(1) Barro and Sala-i-Martin (1992b).
Additional variables in regressions 2, 4 and 6 are regional dummies. For the U.S., personal income refers to personal income excluding transfers.

3.2. σ-convergence Trend from 1926

The β coefficients in Section 3.1 indicate convergence for the 1961-1991 period but do not provide any information on convergence patterns in between periods. The convergence patterns may have changed through time. Furthermore, in order to isolate the long run convergence pattern, it is appropriate to carry out analysis to the period prior to 1961 even at the cost of having to use a less accurate data base. Since Newfoundland joined confederation in 1949 only, the problem for a longer time period using a consistent data base is the limit imposed on the cross-sectional degrees of freedom (ten was already a small number). It is, however, possible to use all the available time series information if the analysis is restricted to σ-convergence and to the examination of the evolution of relative differences in per capita income. The analysis of the 1926 to 1991 period will prove very useful since the

convergence patterns appear to vary a lot through time. However, there appears to be a steady movement towards convergence after the early 1960s.

First, we compare the evolution of relative per capita income in five regions (Atlantic, Quebec, Ontario, Prairies, B.C.) of Canada to bring out the historical pattern of regional income differentials. The long term pattern of relative personal income per capita in these five regions is shown in Figure 3.3. A close look at this Figure indicates that regional income differentials have decreased since 1926. But this trend is not evident when the data are examined only up to 1960s as it has been done by McInnis (1968). The devastating effect of the great depression on the Prairie region is evident. Another feature that comes out of the Figure is the Atlantic region's upward trend since the early 1960s.

Figure 3.4 shows the evolution of σ-convergence from 1926 to 1991 constructed using equation (3). The increasing level of inequality in the 1930s simply reflects the effects of the depression on the Prairie provinces and the decline in inequality thereafter reflects a reversal of those conditions. During the overall period, convergence comes solely from the steady decline in inequality in the recent three decades. It is hard to see any converging trend from 1926 to 1950. The pattern of the GPP series from the 1960s is different from the other four. The increased inequality from 1975 to 1981 is much more pronounced when the GPP measurement is used which is driven by resource boom in the Prairie provinces. The extent of inequality is the highest for the index based on GPP, followed by PIT, EI, PI and PDI. This reflects that capital income has the effect of increasing inequality while transfers and taxes have the effect of reducing inequality.

4. Conclusion

The main empirical results of our study are:

R1 Our analysis suggests that there is evidence of convergence in Canada according to five different measurements of per capita income and output since the early 1960s.

R2 However, there is no evidence of this convergence prior to WWII in any of the time-series analyzed.

R3 The convergence patterns observed for per capita income and nominal GPP in Canada since the 1960 are close to those observed for regions in other countries (the U.S., Japan, and European countries) and between countries (European).

Figure 3.3
Relative Levels of Per Capita Personal Income
by Region, Canada = 1: 1926-1991

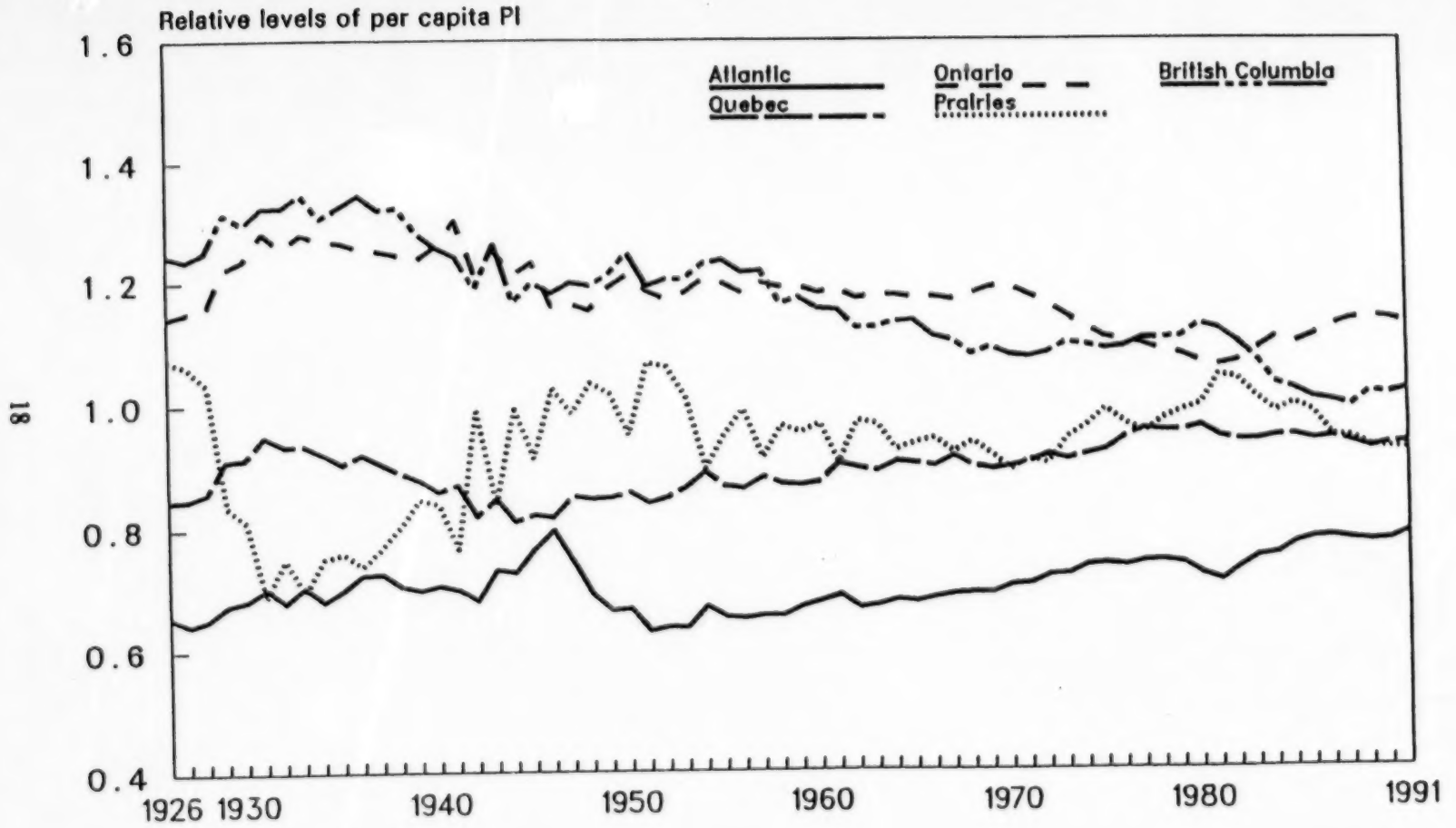
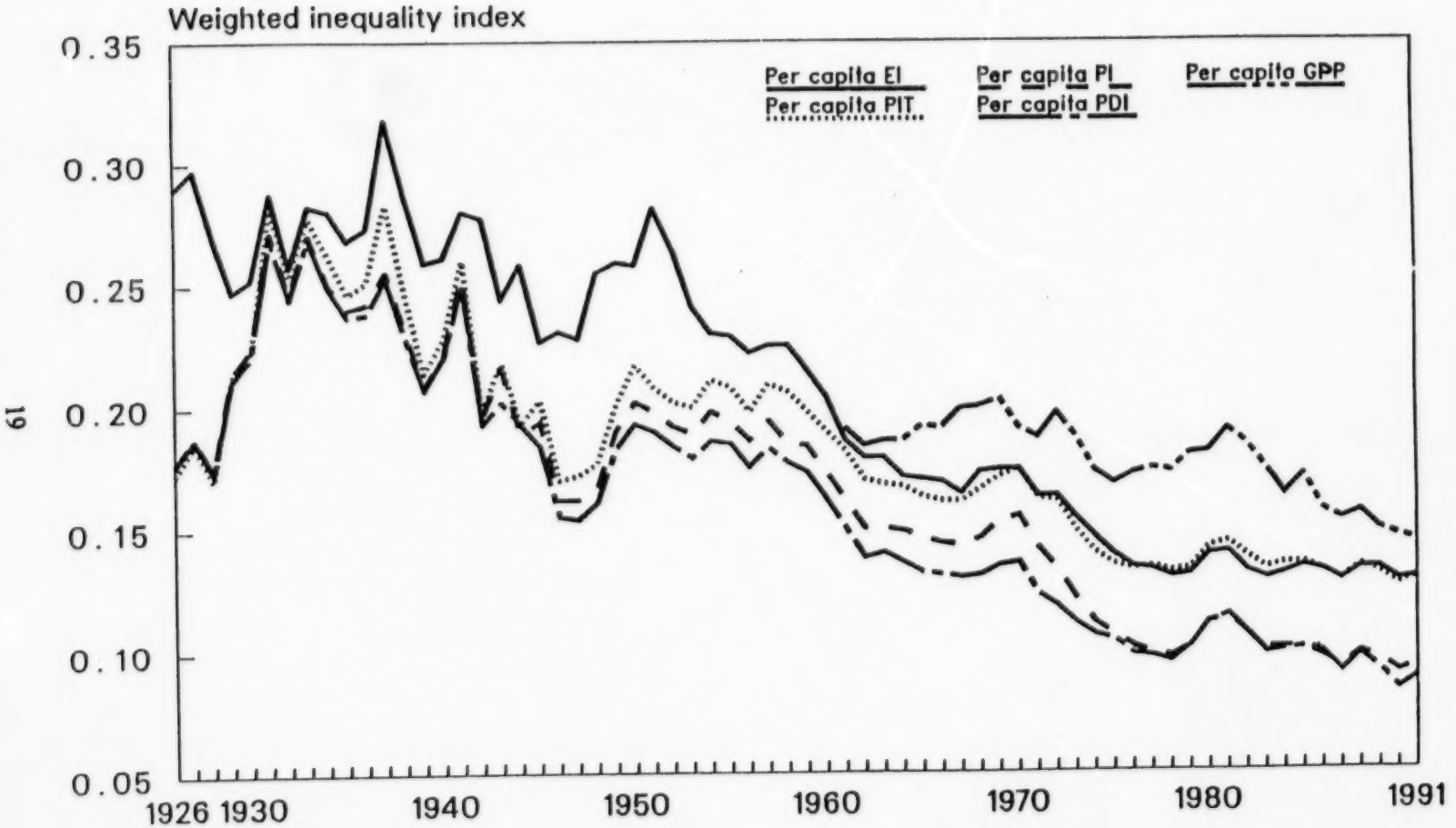


Figure 3.4
Weighted Inequality Index
1926-1991



R4 Since 1961, convergence in regional output is much slower if a regional implicit price deflator is used. For income measures, the use of a national consumer price index instead of a provincial one does not really matter for the speed of convergence.

R5 Since 1961, the speed of convergence is the slowest for per capita GPP (1.05 % per annum) and increases in the following order: per capita EI (1.62 %), per capita PIT (1.63 %), per capita PI (2.41 %) and per capita PDI (2.89 %).

R6 The level of σ-convergence is highest for GPP followed by PIT, EI, PI and PDI.

A number of propositions of interest for economic policy follow from these results.

- From R1, R2, and R4 above, one can conclude that convergence in economic indicators in Canada is not necessarily the rule. Long periods during which disparities remained constant or even worsened have been observed since the 1920s in Canada. Furthermore, R4 implies that a good part of the convergence observed since the beginning of the 1960s can be imputed to a favourable change in the terms of trade. Since there is no reason why relative prices in a resource-base economy should converge or catch-up to manufactured good prices, one cannot assumes that this trend will perpetuate in the future. The reverse might well be the rule.

- R5 and R6 suggest that transfers and taxes have increased the speed of convergence process and reduced the level of regional disparity *ex post*. R4 and R6, however suggest regional economies have not become very diversified.

- R3 shows that convergence patterns are in the same magnitude for regions within a country than across countries (the same fact is observed for U.S. states). On the one side, one can be surprised to find that the use of a common currency, the existence of national trade, similar macroeconomic policies and the high mobility of factors and goods within a country do not result in faster economic convergence among regions that in between countries. On the other hand, new growth theories and development approaches show that increased trade does not necessarily stimulate convergence. Finally, the sceptical observer can probably argue that the pro-convergence forces generated intrinsically by common institutions, free-trade and mobility of factors have been offset by bad policies that have prevented convergence to occur.

The key issue here is whether or not the observed convergence patterns will prevail in the future. Experience shows it is often dangerous to extrapolate the future from the past. It is necessary to consider new factors and forces, to anticipate them to whatever extent possible, and then to integrate them into the framework. For example, both the FTA and

NAFTA and a more globalized economy will force each province to make necessary adjustments. It will therefore become increasingly difficult for governments to erect or maintain barriers, and to provide subsidies. In other words, the economy will become more integrated and more responsive to market signals. This will allow external shocks such as occasional agricultural or energy shocks to cause regions to diverge from one another temporarily. But it will also prompt capital and labour to move to regions with favourable economic environment faster, enabling the convergence process to resume its course. Furthermore, knowledge-intensive and service sectors are becoming more important segments of the economy. And the mobility of resources in these sectors is more than in the traditional manufacturing sector. Thus, an expansion of these sectors along with improved communications and transportation technologies are likely to further push the economy towards convergence. But there is a possibility that temporary external shocks may have persistent effects such that regions may not converge. Moreover, the convergence process itself does not imply that regions will achieve the same level of per capita income/output in the long run. Even in equilibrium, gaps in regional per capita income/output are likely to remain, reflecting differences in labour markets, industrial structure and natural resource endowments.

The study is not intended to go any further to propose solutions. Future study is needed. They should focus on sectoral analysis of each province to find out about the sources of regional economic disparity in Canada. That is, among others, the analysis of provincial differences in labour force participation rates, structural differences in output, and inter-sectoral variations in relative output per worker can yield further understanding of regional economic disparities in Canada.

Appendix: Data Sources

List of Variables and Parameters

Variables	Periods	(Source)
Earned Income	1926-1991	(Calculated using CANSIM Data)
Wages and Salaries	1926-1991	(CANSIM: D11739-D11748)
Farm Income	1926-1991	(CANSIM: D11752-D11761)
Unincorporated Non-farm Net Income	1926-1991	(CANSIM: D11764-D11773)
Personal Income	1926-1991	(CANSIM: D11701-D11710)
Personal Income Minus Governments Transfers	1926-1991	(Calculated using CANSIM Data)
Personal Disposable Income	1926-1991	(CANSIM: D11726-D11736)
Gross Provincial Product at Factor Cost	1961-1991	(Calculated using CANSIM Data)
Net Provincial Income	1961-1991	(CANSIM: D31545, D31559, D31573, D31587, D31601, D31615, D31629, D31643, D31657, D44001)
Capital Consumption Allowance	1961-1991	(CANSIM: D31557, D31571, D31585, D31599, D31613, D31627, D31641, D31655, D31669)
CPI for provinces for Canada	1961-1991 1926-1991	(Conference Board) (CANSIM: D484000)
GDP Deflators, provinces Canada	1961-1991 1926-1991	(Conference Board) (CANSIM: D20556)
Cost of Living Index	1986	(Létourneau)
Total Government Transfers	1926-1991	(CANSIM: D42644-D44342)

to Persons		
The Federal Government's Cash Transfers to Provincial and Local Governments	1961-1990	(CANSIM: D42920, D42948, D42976, D43004, D43032, D43061, D43088, D43116, D43144, D44393)
The Federal Government's Tax Transfers to Provincial Governments	1977-1990	(Finance)
Population	1926-1991	(CANSIM: D15-D24)

Definitions of Variables

GPP = WSSLI + FARM + UNINC + PROF + INT + IVA + CCA;
where, GPP = Gross Provincial Product at Factor Cost;
WSSLI = Wages, salaries and supplementary labour income;
FARM = Accrued net income of farm operators from farm production;
UNINC = Net income of non-farm unincorporated business, including rent;
PROF = Corporate profits before taxes;
INT = Interest and miscellaneous investment income;
IVA = Inventory valuation adjustment;
CCA = Capital consumption allowances.

EI = GPP - PROF - INT - IVA - CCA
where, EI = Earned Income

PIT = EI + INT + DIVIDENDS
= GPP - EP - CCA - IVA;
where, PIT = Personal Income net of transfers to persons;
EP = Earnings not paid out to persons. This item includes undistributed earnings of corporate and government business enterprises, direct taxes of corporate and government business enterprises (including withholding taxes paid to non-residents), government investment income, the adjustment on grain transactions and the inventory valuation adjustment.

PI = PIT + GT;
where, PI = Personal Income

PDI = PI - PDT - OF;
where, PDI = Personal disposable income;

PDT = Personal direct taxes,
OF = Other current transfers to government.

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